

User Guide

# hp StorageWorks Fabric Watch 4.2.x

First Edition (April 2004)

**Part Number:** AA-RV2GA-TE

This user guide provides procedures for setting up and configuring your Fabric Watch software. Fabric Watch monitors the performance and status of HP StorageWorks switches, and can alert Storage Area Network (SAN) administrators when potential problems arise.



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Fabric Watch 4.2.x User Guide  
First Edition (April 2004)  
Part Number: AA-RV2GA-TE

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## about this guide

This user guide provides information to help you:

- Configure and activate Fabric Watch via telnet
- Configure and activate Fabric Watch via Web Tools
- Configure and activate Fabric Watch via SNMP
- Understand Fabric Watch default values

“About this Guide” topics include:

- [Overview](#), page 8
- [Conventions](#), page 9
- [Getting Help](#), page 12

## Overview

This section covers the following topics:

- [Intended Audience](#)
- [Related Documentation](#)

## Intended Audience

This book is intended for use by system administrators and technicians who are experienced with the following:

- HP StorageWorks Fibre Channel SAN switches
- Fabric Operating System version 4.2.x or later

## Related Documentation

Documentation, including white papers and best practices documents, is available via the HP website. Please go to:

<http://www.hp.com/country/us/eng/prodserv/storage.html>

To access Fabric Watch v4.2.x related documents:

1. Locate the "Networked storage" section of the web page.
2. Under "Networked storage," go to the "By type" subsection.
3. Click SAN infrastructure. The SAN infrastructure page displays.
4. Locate the Fibre Channel Switches section.
5. Locate the B-Series Fabric subsection, then go to the "Entry-level" subsection.
6. To access version 4.2.x documents (like this document), select SAN Switch 2/8V or SAN Switch 2/16V. The switch overview page displays.
7. Go to the "product information section," located on the far right side of the web page.
8. Click technical documents.
9. Follow the onscreen instructions to download the applicable documents.



## Conventions

Conventions consist of the following:

- [Document Conventions](#)
- [Text Symbols](#)
- [Equipment Symbols](#)

## Document Conventions

This document follows the conventions in [Table 1](#).

**Table 1: Document Conventions**

Convention	Element
Blue text: <a href="#">Figure 1</a>	Cross-reference links
<b>Bold</b>	Menu items, buttons, and key, tab, and box names
<i>Italics</i>	Text emphasis and document titles in body text
Monospace font	User input, commands, code, file and directory names, and system responses (output and messages)
<i>Monospace, italic font</i>	Command-line and code variables
Blue underlined sans serif font text ( <a href="http://www.hp.com">http://www.hp.com</a> )	Web site addresses

## Text Symbols

The following symbols may be found in the text of this guide. They have the following meanings:



**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.



**Caution:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

---

**Tip:** Text in a tip provides additional help to readers by providing nonessential or optional techniques, procedures, or shortcuts.

---

---

**Note:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

---

## Equipment Symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings:



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

**WARNING:** To reduce the risk of personal injury from electrical shock hazards, do not open this enclosure.

---



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

**WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

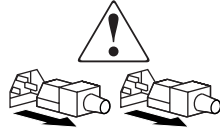
---



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

**WARNING:** To reduce the risk of personal injury from a hot component, allow the surface to cool before touching.

---



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

**WARNING:** To reduce the risk of personal injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

**WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

## Getting Help

If you still have a question after reading this guide, contact an HP authorized service provider or access our web site: <http://www.hp.com>.

## HP Technical Support

Telephone numbers for worldwide technical support are listed on the following HP web site: <http://www.hp.com/support/>. From this web site, select the country of origin.

---

**Note:** For continuous quality improvement, calls may be recorded or monitored.

---

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

## HP Storage Web Site

The HP web site has the latest information on this product, as well as the latest drivers. Access storage at: <http://www.hp.com/country/us/eng/prodserv/storage.html>. From this web site, select the appropriate product or solution.

## HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the HP web site for locations and telephone numbers: <http://www.hp.com>.

# Activating Fabric Watch



This chapter contains the following sections:

- [About Fabric Watch](#), page 14
- [How to Activate Fabric Watch](#), page 15

## About Fabric Watch

Fabric Watch is installed and enabled on SAN Switch Power Pak models only. If you've purchased the SAN Switch base model, you will need to purchase the option separately.

## Monitoring Control

Fabric Watch software monitors the performance and status of HP StorageWorks SAN switches. SAN managers can configure Fabric Watch software to monitor the following:

- Fabric events, such as topology reconfigurations and zone changes
- Physical switch conditions such as fan speeds, power supply status, and chassis temperature
- Port behavior and availability such as state changes, errors, and performance
- Small form factor pluggables (SFPs)
- Security events such as violations and attempted violations

With Fabric Watch software, SAN administrators can place limits, or *thresholds*, on the behavior of switch and fabric *elements*. Fabric Watch monitors these threshold counters and issues an alarm when a counter triggers an *event*. You configure Fabric Watch to receive event notification by selecting one or more specified methods, based on the urgency of the message.

## Requirements

Before you activate Fabric Watch, verify that your system meets the following Fabric Watch requirements:

- Fabric Watch for Fabric OS v4.2.x is compatible only with the following HP StorageWorks switch models:
  - SAN Director 2/128
  - Core Switch 2/64
  - SAN Switch 2/32
  - SAN Switch 2/8V
  - SAN Switch 2/16V
- Fabric Watch requires 2.8 MB of memory.

## How to Activate Fabric Watch

Fabric Watch must be activated on each switch individually before use. Use telnet or Advanced Web Tools to activate Fabric Watch: both methods are described here. Advanced Web tools offers a user friendly Graphical User Interface (GUI).

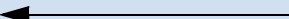
Once activated, configure Fabric Watch to monitor your SAN.

### Activating with telnet

To activate Fabric Watch using telnet commands:

1. Using an account with admin privileges, log in to the switch via telnet. Refer to the *HP StorageWorks Fabric OS Procedures 4.2.x User Guide* for details.
2. Type `licenseShow` to determine whether or not a Fabric Watch license is running on the switch. The window displays a list of optional software licenses. If Fabric Watch appears in the list, the feature is licensed.

```
admin> licenseshow
RQcy9Qc9ccxYdzAG:
  Web license
  Zoning license
  QuickLoop license
  Fabric license
  Remote Switch license
  Remote Fabric license
  Extended Fabric license
  Entry Fabric license
  Fabric Watch license
  Performance Monitor license
  4 Domain Fabric license
  N_Port Virtualization license
```



If the Fabric Watch license does not appear in the list, continue with step 3. If the license is listed, begin using Fabric Watch immediately.

3. Type `licenseadd "key"`, where *key* is the Fabric Watch license key. License keys are case-sensitive. Please note that you must type the license key exactly as it appears on the HP license web site.

```
switch:admin> licenseadd "R9cQ9RcbddUAdRAX"
```

4. Type `licenseShow` to verify that the license is activated. If the license does not appear, verify that you have typed the correct information, then repeat step 3.

If you still do not see the license, verify that you are entering a valid key, and that the license key is correct before repeating step 3.

5. Type `fwclassinit` to initialize the Fabric Watch classes.

## Activating with Advanced Web Tools

To activate Fabric Watch using Advanced Web Tools:

1. Launch your Web browser, enter the switch name or the IP address of the fabric in the **Address** field (for example, *http://111.222.33.1*), and press **Enter**. This launches Advanced Web Tools and displays the **Fabric** view.
2. Click the **Admin View** button on the relevant switch panel. The login window appears.
3. Enter a login name and password and press **Enter**. The login must have admin privileges. The **Administration View** window appears.
4. Click the **License Admin** tab.
5. Enter the license key in the **License Key:** field and click **Add License**. Adding the license activates Fabric Watch.



# How to Configure Fabric Watch

## 2

This chapter contains the following sections:

- [Configuring Fabric Watch](#), page 18
- [User Interfaces](#), page 19
- [Elements](#), page 21
- [Monitoring Tools](#), page 36
- [Events](#), page 49
- [Configurations and Profiles](#), page 51

## Configuring Fabric Watch

Once activated, Fabric Watch launches using the default settings described in Appendix A, “Default Threshold Values.” The factory default thresholds are provided for a quick start and cannot be altered. Advanced users can create custom threshold configurations suitable to each unique environment. If you do not want to use default values, create a new setting that configures Fabric Watch to use values more appropriate to your system.

By setting values, Fabric Watch lets you monitor when values change, or exceed a specified threshold.

---

**Note:** Only custom settings can be modified using the Admin account. Default settings can only be modified using the Root account. HP recommends that the default settings not be modified.

---

To configure a Fabric Watch element, select the fabric element class, then:

- Configure thresholds from the **Advanced Configuration** menu for the selected element.
- Edit the custom thresholds and alarm notifications as appropriate.
- Set threshold boundary level and alarm level monitoring from Default to Custom to apply the new threshold values.

---

**Note:** Alarms occur only after you configure the `fwalarmsfilterset` command to 1. This must only be done when first initializing Fabric Watch. All telnet commands are found in the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

---

The rest of this chapter provides detailed instructions on using specific methods to configure Fabric Watch.

## User Interfaces

This section provides a brief overview of the available interfaces. Further details about Fabric Watch operations for each interface is described in the later chapters of this guide. User interfaces include:

- Telnet
- Advanced Web Tools
- SNMP
- Configuration files and profiles

Configuration files and profiles are covered here, although they are not user interfaces.

### Telnet

Use a telnet session to:

- Query fabric and switch events with the *fwshow* command.
- Query and modify threshold and alarm configurations (whether default or customized) with the *fwconfigure* command.
- View and configure the FRU module with the *fwfrucfg* command.
- View and configure the mail database with the *fwmailcfg* command.

For details about using telnet sessions, refer to [“Using Fabric Watch with Telnet”](#) on page 53.

### Advanced Web Tools

Use Web Tools to:

- View fabric and switch events.
- View and modify threshold and alarm configurations with the Fabric Watch View.
- Upload and download the configuration file with the **Config Admin** tab.
- View and configure the FRU module.
- View and configure the mail database.

For details about using Advanced Web Tools, refer to [“Using Fabric Watch with Advanced Web Tools”](#) on page 79.

## SNMP-based Enterprise Managers

Use SNMP-based enterprise managers to:

- Query the MIB variable for individual fabric and switch elements.
- Query and modify threshold and alarm configurations.
- Receive alarm notification via SNMP traps.
- View and configure the mail database.

For details about using SNMP, refer to [“Using Fabric Watch with SNMP”](#) on page 85.

## Configuration Files

Use configuration files to:

- Make changes in a text editor.
- Upload and download the configuration file through a telnet session or with Web Tools. Uploading and downloading a configuration file to multiple switches efficiently populates your SAN with consistent Fabric Watch settings.

For details about configuration files, refer to [“Using Fabric Watch with Configuration Files”](#) on page 91.

## API

API is used by fabric management programs such as Fabric Manager and hp OpenView. Some fabric management programs use the API to:

- Configure Fabric Watch thresholds or to apply profiles.
- View and configure the FRU module.
- View and configure the mail database.

## Elements

Fabric Watch defines an *element* as any fabric or switch component that the software monitors. Elements are the smallest level of detail: to monitor elements, Fabric Watch categorizes them into *areas*, and subdivides groups of areas into *classes*. Each element maps to an index number, so that all elements can be identified in terms of class, area, and index number.

For example, the *fan* area is a member of the *environment* class. Each fan is an individual element within the area. It is the elements (individual fans) that are monitored. The behavior being monitored might be *fan speed*, as shown in [Table 2](#).

**Table 2: Monitoring Structure**

Class	Area	Element	Monitoring Behavior
Environment	Fan	Fan 1 Fan 2 Fan 3	Speed Speed Temperature

## Classes

Classes serve as high-level categories of elements. [Table 3](#) describes the classes into which Fabric Watch groups all switch and fabric elements.

**Table 3: Fabric Watch Classes**

Class	Description
environment	The environment class groups areas of the physical environment. An environment-class alarm alerts you to problems or potential problems with temperature and power.
fabric	The fabric class groups areas of potential problems arising between devices, including ISL details, zoning, and traffic. A fabric-class alarm alerts you to problems or potential problems with interconnectivity.
field replaceable unit (FRU)	The FRU class monitors the status of FRUs and alerts you if you must replace a FRU. This class monitors states, not thresholds. For details, refer to <a href="#">"FRU Class" on page 24</a> .

**Table 3: Fabric Watch Classes (Continued)**

Class	Description
performance monitor	<p>The performance monitor class is divided into sub-classes: AL_PA performance monitor, EE (end-to-end) performance monitor, and filter performance monitor.</p> <p>The performance monitor classes serve as tuning tools. Performance monitor classes group areas that track the source and destination of traffic. Use performance monitor class thresholds and alarms to determine traffic load and flow and to reallocate resources appropriately.</p>
port	<p>The port class is further divided into three separate classes: port class, E_Port class, and F/FL_Port class.</p> <p>Multiple port classes let you set thresholds for different types of ports.</p>
security	<p>The security class monitors all attempts to breach your SAN security, helping you fine-tune your security measures.</p>
SFP	<p>The SFP class groups areas that monitor the physical aspects of SFPs. An SFP class alarm alerts you to faults that indicate that an SFP might have deteriorated.</p>
switch availability monitor (SAM)	<p>The SAM class monitors the efficiency of all active ports, providing a measure of switch availability. The SAM class provides statistics on switch downtime and uptime to help you identify problems with ports.</p> <p>Check the synchronization status of a port by issuing the <code>portShow</code> command and viewing the <b>portPhys</b> content.</p>

## Areas

Areas represent the behaviors that Fabric Watch monitors. The tables in this section describe Fabric Watch areas by the classes just described.

## Environment Class

Table 4 lists Fabric Watch areas in the environment class and describes each area.

**Table 4: Environment-Class Areas**

Area	Description
fan	The fan area refers to the speed of the fans inside the switch, in rotations per minute. It is important that they spin quickly enough to keep the ambient temperature from rising to dangerous levels.
power supply	The power supply area monitors whether power supplies within the switch are on, off, present, or absent. Fabric Watch monitors power supplies to be sure that power is always available to a switch.
temperature	The temperature area refers to the ambient temperature inside the switch, in degrees Celsius. Temperature sensors monitor the switch in case the temperature rises to levels at which damage occurs.

## Fabric Class

Table 5 lists Fabric Watch areas in the fabric class and describes each area.

**Table 5: Fabric-Class Areas**

Area	Description
domain ID changes	Domain ID changes occur when there is a conflict of domain IDs in a single fabric and the principal switch has to assign another domain ID to a switch.
E_Port downs	Tracks the number of times that an E_Port goes down. E_Ports go down each time you remove a cable or an SFP. SFP failures also cause E_Ports to go down. Transient errors can also cause E_Port downs.
fabric logins	Fabric login messages occur when ports/devices initialize with the fabric.
fabric reconfigure	Indicates reconfigurations of the fabric. The following occurrences can cause a fabric reconfiguration: <ul style="list-style-type: none"> <li>Two fabrics with the same domain ID have connected to one another.</li> <li>Two fabrics have joined.</li> <li>An E_Port has gone offline.</li> <li>A principal link has segmented from the fabric.</li> </ul>

**Table 5: Fabric-Class Areas (Continued)**

Area	Description
segmentation changes	Tracks the cumulative number of segmentation changes. Segmentation changes can occur due to: <ul style="list-style-type: none"> <li>• Zone conflicts.</li> <li>• Incompatible link parameters. During E_Port initialization, ports exchange link parameters; incompatible parameters result in segmentation, but are rare.</li> <li>• Domain conflicts.</li> <li>• Segmentation of the principal link between two switches.</li> </ul>
SFP state changes	Indicates that the state of the SFP is normal or faulty, on or off. A faulty or off state means that you must reinsert, turn on, or replace the SFP.
zone changes	Tracks the number of zone changes, keeping you apprised of the frequency of zone changes. Because zoning is a security provision, frequent zone changes can indicate a security breach or weakness. Zone change messages occur whenever there is a change in zone configurations.

## FRU Class

[Table 6](#) lists Fabric Watch areas in the FRU class and describes each area. Possible states for all FRU-class areas are absent, faulty, inserted, on, off, ready, and up.

**Table 6: FRU-Class Areas**

Area	Description
slot	Indicates that the state of a slot has changed.
power supply	Indicates that the state of a power supply has changed.
fan	Indicates that the state of a fan has changed.
wwn	Indicates that the state of a WWN card has changed.



## Performance Monitor Class

Table 7 lists Fabric Watch areas in the performance monitor class and describes each area.

**Table 7: Performance Monitor-Class Areas**

Area	Description
customer define	The customer define area relies on performance monitor telnet commands. For more information on this area, refer to the <i>HP StorageWorks Fabric OS 4.2.x Command Reference Guide</i> and the "Advanced Performance Monitoring" chapter of the <i>HP StorageWorks Fabric OS 4.2.x Features User Guide</i> .
invalid CRCs	Errors have been detected in the FC frame. Invalid CRC messages occur when the number of CRC errors in Fibre Channel frames for specific source ID (S_ID) and destination ID (D_ID) pairs change. These messages can also be caused by dirty or aging equipment and temperature fluctuations.
receive performance	Receive performance messages appear when the number of word frames traveling from the configured S_ID to the D_ID pair exceeds the configured thresholds.
transmit performance	Transmit performance messages appear due to the number of word frames traveling from the configured S_ID to the D_ID pair; user configuration triggers these messages, so you can use the transmit performance area to tune your network.

## Port Class

[Table 8](#) lists Fabric Watch areas in the port classes and describes each area.

**Table 8: Port-Class Areas**

Area	Description
invalid cyclic redundancy checks (CRCs)	CRCs apply to the last 4 bytes of the frame. Invalid CRCs indicate that a frame is invalid and cannot be transmitted. Invalid CRCs can represent noise on the network. Such frames are recoverable by retransmission. Invalid CRCs indicate a potential hardware problem. These errors occur most commonly in aging fabrics.
invalid words	Invalid words indicate a word that did not transmit successfully. Invalid Words messages usually indicate a hardware problem.
link loss	Link loss errors occur when a link experiences a loss of signal and fails. Both physical and hardware problems can cause link loss errors. Link loss errors frequently occur due to a loss of synchronization. Check for concurrent Loss of Synchronization errors and, if applicable, troubleshoot those errors. Link losses also occur due to hardware failures.
protocol error	Protocol errors indicate a CRC sum disparity. Occasional protocol errors occur due to software glitches. Persistent protocol errors occur due to hardware problems.
receive (RX) performance	Measures the received optical power of the port in KB/sec.
signal loss	Signal loss indicates that no data is moving through the port. A loss of signal usually indicates a hardware problem.

**Table 8: Port-Class Areas (Continued)**

Area	Description
state changes	Indicates that the state of the port has changed for one of the following reasons: <ul style="list-style-type: none"> <li>• The port has gone offline.</li> <li>• The port has come online.</li> <li>• The port is testing.</li> <li>• The port is faulty.</li> <li>• The port has become an E_Port.</li> <li>• The port has become an F_Port.</li> <li>• The port has segmented.</li> <li>• The port has become a trunk port.</li> </ul>
synchronization (sync) loss	Synchronization loss occurs when two devices fail to communicate at the same speed. Sync loss always accompanies link loss. Loss of Synchronization errors frequently occur due to a faulty SFP or cable.
transmit (TX) performance	Measures the transmitted optical power of the port in KB/sec.

## Security Class

[Table 9](#) lists Fabric Watch areas in the security class and describes each area.

**Table 9: Security-Class Areas**

Area	Description
API violation	An API violation occurs when an API access request reaches a secure switch from an unauthorized IP address.
DCC violation	A DCC violation occurs when an unauthorized device attempts to log in to a secure fabric.
front panel violation	A front panel violation occurs when a secure switch detects unauthorized front panel access.
HTTP violation	An HTTP violation occurs when a browser access request reaches a secure switch from an unauthorized IP address.
illegal command	This area tracks instances of commands permitted only to the primary FCS being executed on another switch.
incompatible security DB	This area indicates that secure switches with different version stamps have been detected.

**Table 9: Security-Class Areas (Continued)**

Area	Description
invalid certificates	The primary FCS switch sends a certificate to all switches in the secure fabric before it sends configuration data. Receiving switches accept only packets with the correct certificate; any other certificates are invalid and represent an attempted security breach.
invalid signatures	If a switch cannot verify the signature of a packet, the switch rejects the packet and the signature becomes invalid.
invalid timestamps	If a time interval becomes too great from the time a packet is sent until the time it is received, the timestamp of the packet becomes invalid and the switch rejects the packet.
login violation	A login violation occurs when a secure fabric detects a login failure.
MS violation	A Management Server (MS) violation occurs when an access request reaches a secure switch from an unauthorized WWN. The WWN appears in the ERRLOG.
no FCS	This area indicates that the switch has lost contact with the primary FCS.
RSNMP violation	An SNMP Read violation occurs when an SNMP <code>get</code> operation reaches a secure switch from an unauthorized IP address.
SCC violation	An SCC violation occurs when an unauthorized switch tries to join a secure fabric. The WWN of the unauthorized switch appears in the ERRLOG.
serial violation	A serial violation occurs when a secure switch detects an unauthorized serial port connection request.
SES violation	An SES violation occurs when an SCSI Enclosed Services (SES) request reaches a secure switch from an unauthorized WWN.
SLAP bad packets	A Switch Link Authentication Protocol (SLAP) bad packets failure occurs when the switch receives a bad SLAP packet. Bad SLAP packets include unexpected packets and packets with incorrect transmission IDs.
SLAP failures	A SLAP failure occurs when packets try to pass from a nonsecure switch to a secure fabric.
telnet violation	A telnet violation occurs when a telnet connection request reaches a secure switch from an unauthorized IP address.
TS out of sync	A Time Server (TS) Out of Synchronization error has been detected.
WSNMP violation	An SNMP write violation occurs when an SNMP <code>get</code> or <code>set</code> operation reaches a secure switch from an unauthorized IP address.

## SFP Class

[Table 10](#) lists Fabric Watch areas in the SFP class and describes each area.

**Table 10: SFP-Class Areas**

Area	Description
temperature	The temperature area measures the physical temperature of the SFP, in degrees Celsius. A high temperature indicates that you might need to replace the SFP soon.
receive performance (RX performance)	The receive performance area measures the amount of incoming laser (in $\mu$ watts) to help you determine if the SFP is in good working condition. If the counter often exceeds the threshold, the SFP is deteriorating.
transmit performance (TX performance)	The transmit performance area measures the amount of outgoing laser, in $\mu$ watts. Use this to determine the condition of the SFP. If the counter often exceeds the threshold, the SFP is deteriorating.
current	The current area measures the amount of supplied current to the SFP transceiver. Current area events indicate hardware failures.
supply voltage	The voltage area measures the amount of supplied voltage to the SFP. If this value exceeds the threshold, the SFP is deteriorating.

## Switch Availability Monitor (SAM) Class

[Table 11](#) lists Fabric Watch areas in the switch availability monitor (SAM) class, and describes each area.

**Table 11: SAM-Class Areas**

Area	Description
duration of occurrences	Indicates the amount of time a port stays down.
frequency of occurrences	Indicates the frequency with which a port goes down.
total downtime	Indicates the total downtime of each F_Port and E_Port.
total uptime	Indicates the total uptime of each F_Port and E_Port.

## Configuring Classes

You configure all classes in much the same way: at the CLI and with Web Tools. Web Tools presents the class in the Fabric View window with all other classes. To configure a class with Advanced Web Tools, refer to [“Using Fabric Watch with Advanced Web Tools”](#) on page 79.

You configure all classes in basically the same way. The example below shows specifically how to configure custom thresholds and alarm notification for temperature exceeding the above threshold. This is shown as an example. Some steps may differ depending on the configuration.

To configure the environment class:

1. Type `fwconfigure` and press **Enter**.

### Example

```
switch.admin> fwconfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor cla
10 : Security class
11 : Switch Availability Monitor cl
12 : Quit
Select a class => : (1..12) [12]
```

2. Select the class (in this case Environment) to configure and press **Enter**.

### Example

```
1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12] 1
```

3. Select the area to configure and press **Enter**.

**Example**

```

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4] 1

```

Index	ThresholdName	Status	CurVal	LastEvent	LasteventTime	LastVal	LastState
=====							
1	envTemp001	enabled	31 C				
	inBetween		29 C	Tue Nov 18 14:57:55 2003			Normal
2	envTemp002	enabled	31 C				
	inBetween		29 C	Tue Nov 18 14:57:55 2003			Normal
3	envTemp003	enabled	30 C				
	inBetween		28 C	Tue Nov 18 14:57:55 2003			Normal
4	envTemp004	enabled	30 C				
	inBetween		28 C	Tue Nov 18 14:57:55 2003			Normal
5	envTemp005	enabled	27 C				
	inBetween		27 C	Tue Nov 18 14:57:55 2003			Normal
6	envTemp006	enabled	27 C				
	inBetween		27 C	Tue Nov 18 14:57:55 2003			Normal

4. Select **Disable threshold** to disable monitoring or **Enable threshold** to enable monitoring status. For threshold parameter setup, type 4 to select **Advanced configuration**.



```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 4

```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1
4	envTemp004	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	75
BufSize	10	10

Threshold alarm level is set at : Default

```

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

```

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	3
Above	3	3
InBetween	3	3

```

1 : change behavior type
2 : change behavior interval
3 : change threshold boundary level
4 : change custom unit
5 : change custom time base
6 : change custom low
7 : change custom high
8 : change custom buffer
9 : apply threshold boundary changes
10 : cancel threshold boundary changes
11 : change threshold alarm level
12 : change changed alarm
13 : change exceeded alarm
14 : change below alarm
15 : change above alarm
16 : change inBetween alarm
17 : apply threshold alarm changes
18 : cancel threshold alarm changes
19 : return to previous page
Select choice => : (1..19) [19]

```

5. To change the high limit for the temperature to 65° C, type **7**.

### Example

```
1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low           16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 7
```

6. Type the new threshold parameter and press **Enter**. In this example, the new value is 65.

### Example

```
Enter high threshold => : (-999999999..999999999) [75] 65
```

7. Apply the changes: type **9** and press **Enter**.

**Example**

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1
4	envTemp004	Triggered	1
5	envTemp005	Triggered	1
6	envTemp006	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	0
High	75	65
BufSize	10	10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8  
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	3
Above	3	3
InBetween	3	3

```

1 : change behavior type           11 : change threshold alarm level
2 : change behavior interval       12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit             14 : change below alarm
5 : change custom time base        15 : change above alarm
6 : change custom low              16 : change inBetween alarm
7 : change custom high             17 : apply threshold alarm changes
8 : change custom buffer           18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 9

```

8. To return to the main menu, press **Enter**.

## Monitoring Tools

Fabric Watch uses a number of tools to monitor switch and fabric performance, as well as to alert SAN managers of potential problems. The monitoring tools include counters, thresholds, and events.

### Counters

*Counters* represent the value of a behavior variable. Counters can be either *cumulative* or *absolute*. A counter can represent the total number of times that a given error occurred since Fabric Watch began logging occurrences of that error (cumulative), or it can represent the current value of a particular behavior, such as fan speed or chassis temperature (absolute).

To determine that an event has occurred, Fabric Watch compares counter values to threshold values.

### Thresholds

*Thresholds* consist of *traits*, *behaviors*, and *alarms*; some are optional, some are required. Fabric Watch uses these components to determine how and when to check the status of a variable. Fabric Watch groups these components, identifying them as a threshold to efficiently report errors to SAN administrators. Thresholds identify values or ranges of values to which Fabric Watch compares changes to counters to determine if a given element warrants an alarm. Each boundary is configured to establish a different type of threshold/reading.

Each Fabric Watch threshold has a unique name. Use the information provided in “[Identifying Thresholds](#)” on page 42 to identify the individual elements in error messages.

The Fabric Watch thresholds are described in detail in “[Common Thresholds](#)” on page 45.

## Traits

*Traits* are the characteristics that define a threshold. Traits are area-based; when you configure a trait, that trait applies to every element in an area. Traits are nonvolatile; you do not need to reconfigure traits when you restart a switch.

[Table 12](#) lists the traits that can define a threshold and what each trait identifies.

**Table 12: Threshold Traits**

Trait	Definition
unit string	Unit of measurement that Fabric Watch alarms use to display the value of a particular counter.
time base	Basic unit of time in which Fabric Watch records events.
low boundary	Limit below which the value of a counter does not register an event.
high boundary	Limit above which the value of a counter does not register an event.
buffer size	Size of a threshold buffer. Buffer size determines the distance between the upper buffer and the upper boundary, and the distance between the lower buffer and the lower boundary. The buffer size establishes the buffer zones (see <a href="#">Figure 1</a> ).

## Behaviors

Threshold behavior defines if and when Fabric Watch registers an event against a given threshold. These behaviors are element-based, so you must configure traits for each individual element. [Table 13](#) lists and explains threshold behaviors.

**Table 13: Threshold Behavior**

Behavior	Description
behavior interval	Configures the amount of time that must elapse between continuous alarms.
behavior mode	Configures a threshold as either continuous or triggered. By default, Fabric Watch monitors only triggered events.
status	Configures a threshold as enabled (active) or disabled (inactive). Fabric Watch enables thresholds by default. Status is nonvolatile. You can disable thresholds permanently because the setting persists after the switch reboots.

## Behavior Modes

The behavior mode of a threshold determines the conditions under which Fabric Watch software registers an event. Fabric Watch constantly polls the software at the shortest possible time interval. Events occur the moment that a counter triggers them, regardless of behavior.

*Triggered* behavior generates an alarm notification the first time a counter value of the monitored element exceeds predefined threshold boundary limits.

*Continuous* behavior generates an alarm notification on each sample period until the prevailing triggering condition is removed.

## Triggered Behavior

In triggered behavior mode, Fabric Watch registers an event when a counter changes to exceed a configured threshold. Fabric Manager polls the fabric every six seconds to determine if a counter value qualifies as an event.

[Table 14](#) lists each event type and describes the indicator trigger for that event in triggered mode. Events in triggered mode occur independently of the behavior interval. For example, if the continuous behavior is set for every six seconds, continuous mode triggers the event at the next six second interval. Triggered behavior, however, triggers the event immediately.

**Table 14: Triggered Behavior**

Event	Circumstances
above event	Registers the time that the counter rises above the high boundary. If, in a range threshold, the counter rises above the high boundary, falls within the buffer, and then rises above the boundary again, it does not trigger an event when it moves from the buffer to above the boundary.
below event	Registers the time that the counter falls below the low boundary. If, in a range threshold, the counter falls below the low boundary, falls within the buffer, and then falls below the boundary again, it does not trigger an event when it moves from the buffer to below the boundary.
changed event	Registers the time that the value of the counter changes. Whenever the counter value changes, the event registers.
exceeded event	Registers the time that the counter rises above the high boundary or falls below the low boundary.
in-between event	Registers the elapsed time that the counter waits before returning to a value between the high and low boundaries.

### Continuous Behavior

In continuous behavior mode, Fabric Watch registers an event whenever a counter exceeds configured thresholds, and continues to register an event every designated time interval until the variable falls within the threshold again. SAN managers designate the time interval, or *behavior interval*. For example, if the temperature of a switch exceeds its high boundary while in continuous behavior mode, Fabric Watch registers an *above* event at the moment that the counter crosses the threshold and continues to register each time the behavior interval elapses until the temperature returns to a value below the threshold. [Table 15](#) lists each event type and explains when a counter triggers that event in continuous mode.

**Table 15: Continuous Behavior Matrix**

Event	Circumstances
changed event	Registers the time that the value of the counter changes. Each time the counter value changes, the event registers.
above event	Registers the moment that the counter rises above the high boundary and registers at each time interval until the value falls below the high boundary.
below event	Registers the moment that the counter falls below the low boundary and registers again at each time interval until the value rises above the low boundary.
exceeded event	Registers the moment that the counter rises above the high boundary or falls below the low boundary and again at each time interval until the value returns to the acceptable range.
in-between event	Registers the moment that the counter returns to a value between the high and low boundaries and again at each time interval until the value exceeds the acceptable range.

### Alarms

You can configure Fabric Watch to deliver an alarm message by selecting one or more appropriate methods, based on the urgency settings. For example, an email alert can be set for critical alarms where an immediate response is requested. The informative type messages can be redirected to an error log or an SNMP trap that can be examined whenever it is convenient.

Alarm types include:

- Switch Event
- SNMP Trap

- RapiTrap
- Port Log Lock
- Email Alert

---

**Note:** Alarms occur only after you configure the `fwalarmsfilterset` command to 1. For more information, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

---

## Switch Event (Error) Log Entry

The switch event (error) log holds up to 1024 entries. This error log stores event information but does not actively send alerts. Enter the `ErrShow` command to view the log.

### SNMP Trap

Simple Network Management Protocol (SNMP) performs an operation called a *trap* that notifies a management station (a workstation that runs network management applications using SNMP protocol) when events occur.

SNMP Management Management Stations running management programs such as HP CIM7 or hp OpenView can be configured to receive traps from the switch. Configure the software to receive trap information from the network device. You must also configure the SNMP agent on the switch to send the trap to the management station using the `agtcfgset` command. (For more information on the `agtcfgset` command, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*).

An SNMP trap forwards the following information to an SNMP management station:

- Name of the element whose counter registered an event
- Class, area, and index number of the threshold that the counter crossed
- Event type
- Value of the counter that exceeded the threshold
- State of the element that triggered the alarm
- Source of the trap

This alarm stores event information but does not actively send alerts.



### RapiTrap

RapiTrap actively alerts SAN managers to events. After you enable RapiTrap, Fabric Watch forwards all event information to a designated proxy switch. The host API automatically configures the proxy switch based on firmware version. The switch forwards the information to a server and alerts the SAN manager to event activity.

Management applications such as CIM7 and hp Open View use the API determine the manner that RapiTrap presents alarms to the user.

### Port Log Lock

The port log locks to retain detailed information about an event preventing it from scrolling out of the log in case the error log is full. This alarm stores event information but does not actively send alerts, which is done automatically when some thresholds are exceeded and an alert is triggered.

For more information about locking, unlocking, and clearing the port log, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

### Email Alert

Email alert sends information about a switch event to a specified email address. Email alert can send information about any error from any element, area, and class.

The email specifies the threshold and describes the event, much like an error message. You must use `fwmailcfg` to configure email alerts.

---

**Note:** Email notification is disabled temporary during the switch reboot process to prevent a flood of unnecessary emails.

---

To troubleshoot Fabric Watch using email alerts:

1. Enter **hostname** (SAN Switch 2/16V) or **ippaddrset** (Core Switch 2/64; set for both CP0 and CP1) to set the hostname and verify that you have set it correctly.



**Caution:** Use unique names for the hostname and the switchname.

---

2. Add the switch hostname and IP address to the Yellow Pages (YP) table/Domain Name Server (DNS).
3. To set the domain name and Name Server IP address and to verify that the domain name and Name Server are configured properly, use `dnsconfig`.
4. To set and enable a recipient email address for any class, use `fwmailcfg`.
5. To check the recipient address, use `fwmailcfg` option 1 and class number.
6. To verify email alert, use `fwmailcfg` option 4 and configured class.
7. To ensure that the Fabric Watch alarm is on, type `fwalarmsfiltershow`.

---

**Note:** Alarms occur only after you configure the `fwalarmsfilterset` command to 1. For more information, refer to `fwalarmsfilterset` in the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

---

## Identifying Thresholds

You can identify a Fabric Watch threshold by its unique name. This standard naming format simplifies identification of elements in error messages. Threshold names consist of the following three parts, with no separators:

- Class name abbreviation
- Area name abbreviation
- Element index number

[Table 16](#) presents each Fabric Watch class and the class abbreviation.

**Table 16: Class Name Abbreviations**

Class	Abbreviation
AL_PA performance monitor	alpa
E_Port	eport
end-to-end performance monitor	ee
environment	env
fabric	fabric
filter performance monitor	filter
Optical F/FL_Port	fopport
port	port
security	sec
SFP	sfp
switch availability monitor	sam

[Table 17](#) presents each Fabric Watch area and area abbreviation.

**Table 17: Area Name Abbreviations**

Area	Abbreviation
API violation	API
DCC violation	DCC
downtime	downTime
E_Port down	ED
fabric reconfigure	FR
frequency of occurrence	Freq
HTTP violation	HTTP
incompatible security database	IncDB
invalid CRCs	CRC
invalid timestamp	InvTS
link failures	Link
loss of signal	Signal
MS violation	MS
name server request	NR
power supply	PS
receiver power	RXP
RX performance	RX
segmentation change	SC
SES violation	SES
SLAP bad packet	SlapBP
state change	State
temperature	Temp
TS out-of-sync	TSSync
uptime	upTime
zoning change	ZC

Area	Abbreviation
current	Crnt
domain ID	DI
duration of occurrence	AvgDur
fabric login	FL
fan speed sensor	fan
front panel violation	Panel
illegal command	IllCmd
invalid certificate	InvCert
invalid signature	InvSign
invalid words	Words
log-in violation	Login
loss of sync	Sync
name server login	NL
no FCS	NoFCS
protocol errors	ProtoErr
RSNMP violation	RSNMP
SCC violation	SCC
serial violation	Serial
SFP state change	SS
SLAP failure	SlapFail
telnet violation	Telnet
transmitter power	TXP
TX performance	TX
WSNMP violation	WSNMP

Index numbers, the third and final component of threshold names, consist of three digits that correspond to where elements appear in a series. For instance, if the element in question is the third temperature sensor on a switch, its number would be 003.

---

**Note:** Index numbers for all port and SFP class thresholds begin with the number 000 (using the Fabric OS port-numbering conventions). Environment class threshold index numbers begin with the number 001. Fabric class index numbers always appear as 000.

---

For example, the command `foportState003` identifies a state change (“State”) in the fourth (“003,” where numbering begins with 000) optical F/FL\_Port (“foport”).

## Common Thresholds

The thresholds in this section serve as identifiers for series of boundaries, and include:

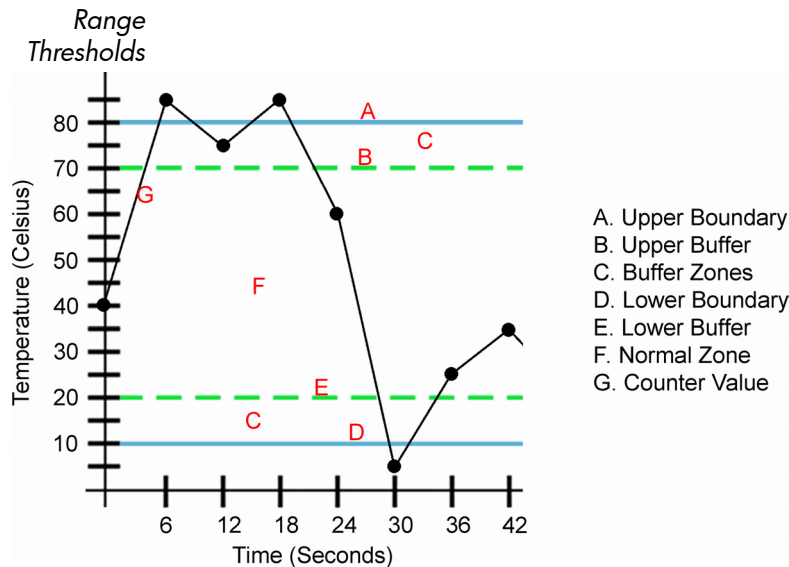
- Range threshold
- Rising/falling threshold
- Change monitor threshold

### Range Threshold

A range threshold consists of a high and low boundary. All values between these boundaries form a “normal region.” When a counter crosses a boundary, that occurrence registers an *event*.

Counters can oscillate around the upper or lower boundary of a range threshold and, as a result, cause numerous events in a short period of time. To reduce the number of events that occur as counters move from beyond a boundary to within a boundary, configure *buffers*, or values below the high boundary and above the low boundary. When a counter changes from a value that exceeds a boundary to a value that falls between the boundary and a buffer, no event registers. An event registers only if the counter returns to a normal value beyond the buffer.

[Figure 1](#) illustrates a range threshold with buffers. The values at 6 seconds, 18 seconds, and 30 seconds generate events because they exceed boundaries.



**Figure 1: Range threshold with buffers**

The value at 12 seconds does not generate an event because, although it crosses a boundary, it remains in the buffer zone.

The values at 24 seconds and 36 seconds generate events because they cross the upper boundary and lower boundary, respectively, and return to normal values beyond the buffer zone.

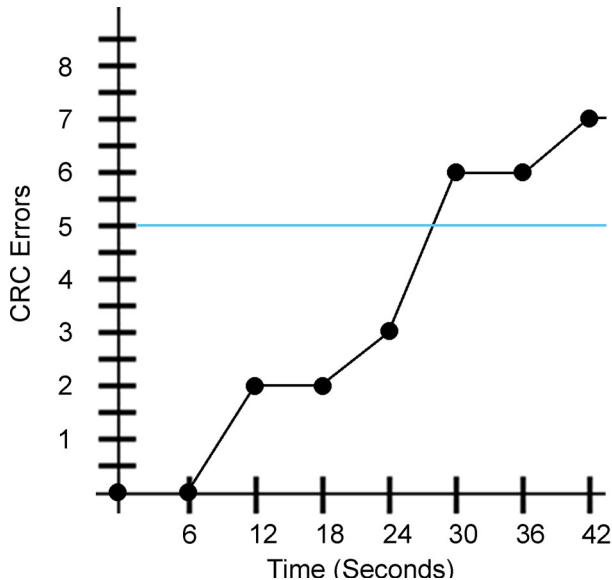
To configure a range threshold:

- Configure a high boundary.
- Configure a low boundary.
- Configure a buffer (optional).
- Configure an exceeded alarm.
- Configure an in-between alarm.

### Rising/Falling Threshold

A rising/falling threshold consists of only one boundary. In a rising/falling threshold, all values to one side of the boundary qualify as the normal zone, and all others generate events.

Figure 2 presents a rising/falling threshold at which the normal zone exists below the boundary and values above the boundary exceed the threshold. In the figure, an event registers when, at 30 seconds, the counter exceeds the boundary.



**Figure 2: Rising/falling threshold**

This particular figure presents a rising/falling threshold with a high boundary. Rising/falling thresholds can also consist of low boundaries, in which the normal zone appears above the boundary and events register when counters dip below the boundary.

To configure a rising/falling threshold:

1. Configure a high boundary or a low boundary.
2. Configure an above alarm (for thresholds with high boundaries) or a below alarm (for thresholds with a low boundary).

### Change Monitor Threshold

For some elements, Fabric Watch registers an event *whenever the counter value changes*, not only if the counter crosses a boundary. The change monitor threshold is a threshold that requires no boundary trait because it automatically assigns the current counter value as the boundary. Whenever the counter value changes, Fabric Watch registers an event.

To configure a change monitor threshold, configure a changed alarm.

## Events

Whenever a counter crosses a threshold, Fabric Watch identifies the occurrence as an event. Configure Fabric Watch so that events trigger alarms that notify you that the event took place. Fabric Watch software recognizes the events described in [Table 18](#).

**Table 18: Events**

Event	Description
below	A counter has fallen below the low boundary. This event applies only to rising/falling thresholds.
changed	A counter value has changed. This event applies only to change monitor thresholds.
exceeded	A counter has risen above the high boundary or fallen below the low boundary. This event applies only to range thresholds.
in-between	A counter value has returned to a value between the high boundary and the low boundary. This event applies only to range thresholds.
over	A counter has risen above the high boundary. This event applies only to rising/falling thresholds.

## Severity Levels

Severity levels appear in error messages, indicating the urgency of each alarm. [Table 19](#) lists these severity levels. Only Levels 3 and 4 appear in user messages; all other levels are MIB-related.

**Table 19: Fabric OS Severity Levels**

Severity Level	Traps
0	send no event traps
1	critical
2	error



**Table 19: Fabric OS Severity Levels (Continued)**

Severity Level	Traps
3	warning
4	informational
5	debug

## Configurations and Profiles

SAN administrators can use configuration files and Fabric Watch-specific configuration files (called *profiles*) to customize Fabric Watch and store customized instructions.

Fabric Watch includes a default value for each element that you configure. These default values constitute the default configuration. You cannot alter the default values because they are used to reset values. Fabric Watch maintains a second configuration that you customize. To use custom values, configure your custom values and set Fabric Watch to use the custom configuration.

---

**Note:** If a default value matches a custom value, you can save memory if you enter no custom value at all and configure Fabric Watch to use the default value.

---

### Configuration File

The configuration file of a switch includes all Fabric Watch configuration information. Use a text editor to manually configure Fabric Watch thresholds and alarms. For more information, refer to “[Using Fabric Watch with Configuration Files](#)” on page 91.

### Profiles

Fabric Watch configurations, also known as *profiles*, are preset subsets of configuration files that are specialized to particular types of networks. You can download a Fabric Watch configuration to your switch and to configure Fabric Watch software to run from the subset or from your standard configuration file.





# Using Fabric Watch with Telnet

## 3

You can configure most Fabric Watch thresholds during a telnet session using the `fwconfigure` command. For a list of all Fabric Watch-related telnet commands, refer to the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

This chapter contains the following sections:

- [Configure Threshold Boundaries](#), page 54
- [Configure Threshold Behaviors](#), page 60
- [Configure Alarms](#), page 70
- [Set Up Email Alerts](#), page 76

## Configure Threshold Boundaries

Consider your requirements as you configure threshold boundaries. If a given element presents problems only when it rises above a certain value, configure only a high boundary; otherwise, you receive unnecessary error messages.

If default threshold boundaries satisfy your requirements, do not create identical custom values; unnecessary customization wastes space in the configuration file and wastes memory. Until you create a custom value, it does not appear in the configuration file.

If you need to monitor occurrences only when the value of an element changes, do not configure any threshold boundaries. Such a threshold requires only a *changed* alarm.

Configure threshold boundaries for elements that require a maximum limit, a minimum limit, or both.

To configure threshold boundaries use the procedure described here:

1. Type `fwconfigure` to view a list of Fabric Watch classes.

### Example

```
switch.admin> fwconfigure

1  : Environment class
2  : SFP class
3  : Port class
4  : Fabric class
5  : E-Port class
6  : F/FL Port (Optical) class
7  : Alpa Performance Monitor class
8  : EE Performance Monitor class
9  : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit

Select a class => : (1..12) [12]
```

2. Type the class number to configure and press **Enter**.

**Example**

```

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12] 1

```

3. Type the area number to configure and press **Enter**. A list of thresholds in that area appears.

**Example**

```

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4] 1

```

Index	ThresholdName	Status	CurVal	LastEvent	LasteventTime	LastVal	LastState
=====							
1	envTemp001	enabled	50 C				
	inBetween		46 C	Thu Oct 23 22:32:44 2003			Normal
2	envTemp002	enabled	49 C				
	inBetween		45 C	Thu Oct 23 22:32:44 2003			Normal
3	envTemp003	enabled	30 C				
	inBetween		30 C	Thu Oct 23 22:32:44 2003			Normal

4. To proceed to the Advanced Configuration menu, type 4 and press **Enter**. Fabric Watch provides a list of default and custom values and presents the current settings for each element in the area.

**Example**

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 4

Index ThresholdName      BehaviorType      BehaviorInt
  1      envTemp001        Triggered          1
  2      envTemp002        Triggered          1
  3      envTemp003        Triggered          1

Threshold boundary level is set at : Default
Default      Custom
  Unit          C          C
Time base
  Low           0          0
  High          67         67
  BufSize       10         10

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

          Default      Custom
Changed          0          0
Exceeded          0          0
  Below          3          3
  Above          3          3
InBetween        3          3

```

5. To configure the low or high boundary, type 6 or 7.



**Example**

```

1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low            16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 6
Enter low threshold => : (-999999999..999999999) [0]

```

**6. Type a new boundary value.****Example**

```

Enter low threshold => : (-999999999..999999999) [0] 60
Index ThresholdName BehaviorType BehaviorInt
  1   envTemp001      Triggered          1
  2   envTemp002      Triggered          1
  3   envTemp003      Triggered          1
Threshold boundary level is set at : Default
Default      Custom
  Unit              C          C
Time base
  Low              0          60
  High             67         67
BufSize          10          3

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

          Default      Custom
Changed          0          0
Exceeded          0          0
  Below          3          3
  Above          3          3
InBetween        3          3

```

7. Type 9 to apply the configuration changes at the prompt. Before you complete this step, changes exist only in volatile RAM; when saved, the changes are moved to nonvolatile flash memory.

### Example

```
Select choice => : (1..19) [19] 9
```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Triggered	1
3	envTemp003	Triggered	1

Threshold boundary level is set at : Default

	Default	Custom
Unit	C	C
Time base		
Low	0	60
High	67	67
BufSize	10	3

Threshold alarm level is set at : Default  
 Errlog-1, SnmpTrap-2, RapiTrap-8  
 EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	3
Above	3	3
InBetween	3	3

8. To change the threshold boundary level, type 3.

### Example

```
1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low            16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
```

Select choice => : (1..19) [19] **3**

9. Type 2 to configure Fabric Watch to use the new custom settings.

### Example

```

1 : Default
2 : custom
Enter boundary level type => : (1..2) [1] 2

Index ThresholdName      BehaviorType      BehaviorInt
  1     envTemp001        Triggered         1
  2     envTemp002        Triggered         1
  3     envTemp003        Triggered         1

Threshold boundary level is set at : Custom
Default      Custom
  Unit              C          C
Time base
  Low              0          60
  High             67          67
  BufSize          10          3
Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16
Valid alarm matrix is 27

Default      Custom
  Changed      0          0
  Exceeded     0          0
    Below      3          3
    Above      3          3
  InBetween    3          3

```

## Configure Threshold Behaviors

Configure threshold behaviors to establish how frequently Fabric Watch reports events. For details about configuration considerations, refer to [“How to Configure Fabric Watch”](#) on page 17.

To configure threshold behaviors:

1. At the prompt, type `fwconfigure` and press **Enter**.

### Example

```
switch.admin> fwconfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12]
```

2. Type the class number and press **Enter**.

**Example**

```

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12] 1

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]

```

**3. Type the area number and press **Enter**.****Example**

```

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4] 1

```

Index	ThresholdName	Status	CurVal	
	LastEvent	LasteventTime	LastVal	LastState
1	envTemp001	enabled	50 C	
	below	Fri Oct 24 21:45:54 2003	50 C	Normal
2	envTemp002	enabled	49 C	
	below	Fri Oct 24 21:45:54 2003	49 C	Normal
3	envTemp003	enabled	30 C	
	below	Fri Oct 24 21:45:54 2003	30 C	Faulty

4. To view the Advanced Configuration menu, type 4 and press **Enter**.

### Example

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 4

Index ThresholdName      BehaviorType      BehaviorInt
  1      envTemp001        Triggered          1
  2      envTemp002        Triggered          1
  3      envTemp003        Triggered          1

Threshold boundary level is set at : Custom
Default          Custom
  Unit              C          C
Time base
  Low              0          60
  High            67          67
BufSize          10          3

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

          Default      Custom
Changed          0          0
Exceeded          0          0
  Below          3          3
  Above          3          3
InBetween        3          3

```

5. To configure the behavior type: type 1 and press **Enter**.

**Example**

```

1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low            16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 1
Select threshold index => : (1..2) [1]

```

6. Type the threshold index and press **Enter**.

**Example**

```

Select threshold index => : (1..5) [1] 2
1 : triggered
2 : continuous
Enter behavior type => : (1..2) [1]

```

7. Type the number of the behavior to apply to the threshold and press **Enter**. If you selected triggered behavior, you have completed this task; if you selected continuous behavior, proceed with step 8.

### Example

```
Enter behavior type => : (1..2) [1] 1
```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Continuous	1
3	envTemp003	Triggered	1

Threshold boundary level is set at : Custom

	Default	Custom
Unit	C	C
Time base		
Low	0	60
High	67	67
BufSize	10	3

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8  
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	3
Above	3	3
InBetween	3	3

8. To configure the behavior interval, type 2 and press **Enter**.



**Example**

```

1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low            16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 2
Select threshold index => : (1..2) [1]

```

9. Type the index number of the threshold to configure and press **Enter**.

**Example**

```

Select threshold index => : (1..5) [1] 1
Enter behavior interval in seconds => : (1..1000) [1]

```

10. Type the behavior interval and press **Enter**.

**Example**

Enter behavior interval in seconds => : (1..1000) [1] **2**

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Continuous	1
3	envTemp003	Triggered	1
4	envTemp004	Triggered	1
5	envTemp005	Triggered	1

Threshold boundary level is set at : Custom

	Default	Custom
Unit	C	C
Time base		
Low	0	60
High	67	67
BufSize	10	3

Threshold alarm level is set at : Custom

Errlog-1, SnmpTrap-2, RapiTrap-8  
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	0
Below	3	3
Above	3	3
InBetween	3	3

## Enable Thresholds

Enable thresholds so that Fabric Watch tracks counter values, registers events, and triggers alarms.

To enable Fabric Watch thresholds:

1. At the prompt, type `fwconfigure` and press **Enter**.

### Example

```
switch.admin> fwconfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12]
```

2. Type the class number and press **Enter**.

**Example**

```

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12] 1

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]

```

**3. Type the area number and press **Enter**.****Example**

```

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4] 1

```

Index	ThresholdName	Status	CurVal
	LastEvent	LasteventTime	LastVal
LastState			
1	envTemp001	enabled	49 C
	below	Mon Jan 13 14:19:21 2004	49 C
			Faulty
2	envTemp002	enabled	44 C
	below	Mon Jan 13 14:23:02 2004	44 C
			Faulty

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]

```

**4. To enable a threshold, type 3 and press **Enter**.**

**Example**

```

1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low            16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 1
Select threshold index => : (1..5) [1]

```

**5. Type the threshold index number and press **Enter**.****Example**

```

Select threshold index => : (1..2) [1] 1

```

Index	ThresholdName	Status	CurVal	LastEvent	LasteventTime	LastVal	LastState
1	envTemp001	enabled	49 C	below	Mon Jan 13 14:19:21 2004	49 C	Faulty
2	envTemp002	enabled	44 C	below	Mon Jan 13 14:23:33 2004	44 C	Faulty

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]

```

## Configure Alarms

Configure alarms to determine the way that Fabric Watch responds to events.

To configure alarms:

1. At the prompt, type `fwconfigure` and press **Enter**.

### Example

```
admin> fwconfigure

1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12]
```

2. Type the class number and press **Enter**.

### Example

```
1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpa Performance Monitor class
8 : EE Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : Quit
Select a class => : (1..12) [12] 1

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4]
```

3. Type the area number and press **Enter**.

#### Example

```

1 : Temperature
2 : Fan
3 : Power Supply
4 : return to previous page
Select an area => : (1..4) [4] 1

Index ThresholdName                Status      CurVal
      LastEvent                LasteventTime LastVal      LastState
=====
   1   envTemp001                enabled      49 C
      below   Mon Jan 13 14:19:21 2003  49 C      Faulty
   2   envTemp002                enabled      44 C
      below   Mon Jan 13 14:23:52 2003  44 C      Faulty

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5]

```

4. Type 4 and press **Enter** to view the Advanced Configuration menu.  
See the following example.

```

1 : refresh
2 : disable a threshold
3 : enable a threshold
4 : advanced configuration
5 : return to previous page
Select choice => : (1..5) [5] 4

Index ThresholdName      BehaviorType      BehaviorInt
  1     envTemp001        Triggered         1
  2     envTemp002        Continuous         1
  3     envTemp003        Triggered         1
  4     envTemp004        Triggered         1
  5     envTemp005        Triggered         1

Threshold boundary level is set at : Custom

          Default      Custom
Unit      C           C
Time base
  Low      0           60
  High     67          67
BufSize    10          3

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27

          Default      Custom
Changed      0           0
Exceeded      0           0
  Below      3           3
  Above      3           3
InBetween     3           3

1 : change behavior type           11 : change threshold alarm level
2 : change behavior interval       12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit             14 : change below alarm
5 : change custom time base        15 : change above alarm
6 : change custom low              16 : change inBetween alarm
7 : change custom high             17 : apply threshold alarm changes
8 : change custom buffer           18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19]

```



5. Type the number of the alarm to change and press **Enter**.

#### Example

```

1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low           16 : change inBetween alarm
7 : change custom high          17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 13

Errlog-1, SnmpTrap-2, RapiTrap-8
EmailAlert-16

Valid alarm matrix is 27
Enter exceeded alarm matrix => : (0..27) [0]

```

6. Type the matrix value for the alarms to trigger with the event. Matrix numbers are cumulative. To configure error logging, type 1. To configure error logging (1) and SNMP trap (2), type 3 (2+1).

**Example**

Enter exceeded alarm matrix => : (0..27) [0] **17**

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Continuous	1
3	envTemp003	Triggered	1
4	envTemp004	Triggered	1
5	envTemp005	Triggered	1

Threshold boundary level is set at : Custom

	Default	Custom
Unit	C	C
Time base		
Low	0	60
High	67	67
BufSize	10	3

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8  
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

1 : change behavior type	11 : change threshold alarm level
2 : change behavior interval	12 : change changed alarm
3 : change threshold boundary level	13 : change exceeded alarm
4 : change custom unit	14 : change below alarm
5 : change custom time base	15 : change above alarm
6 : change custom low	16 : change inBetween alarm
7 : change custom high	17 : apply threshold alarm changes
8 : change custom buffer	18 : cancel threshold alarm changes
9 : apply threshold boundary changes	19 : return to previous page
10 : cancel threshold boundary changes	

Select choice => : (1..19) [19]

7. To apply your configuration changes, type 17. Before you complete this step, changes exist in volatile RAM; once applied, changes move to nonvolatile flash memory. To turn off alarms, configure alarms to 0 or run `fwAlarmsFilterSet(0)`.

### Example

```

1 : change behavior type          11 : change threshold alarm level
2 : change behavior interval      12 : change changed alarm
3 : change threshold boundary level 13 : change exceeded alarm
4 : change custom unit           14 : change below alarm
5 : change custom time base      15 : change above alarm
6 : change custom low            16 : change inBetween alarm
7 : change custom high           17 : apply threshold alarm changes
8 : change custom buffer         18 : cancel threshold alarm changes
9 : apply threshold boundary changes 19 : return to previous page
10 : cancel threshold boundary changes
Select choice => : (1..19) [19] 17

```

Index	ThresholdName	BehaviorType	BehaviorInt
1	envTemp001	Triggered	1
2	envTemp002	Continuous	1
3	envTemp003	Triggered	1
4	envTemp004	Triggered	1
5	envTemp005	Triggered	1

Threshold boundary level is set at : Custom

	Default	Custom
Unit	C	C
Time base		
Low	0	60
High	67	67
BufSize	10	3

Threshold alarm level is set at : Default

Errlog-1, SnmpTrap-2, RapiTrap-8  
EmailAlert-16

Valid alarm matrix is 27

	Default	Custom
Changed	0	0
Exceeded	0	17
Below	3	3
Above	3	3
InBetween	3	3

## Set Up Email Alerts

Email alerts let you (or another user) receive an alert via email any time an alarm is triggered.

To configure email alerts:

1. At the prompt, enter the `fwmailcfg` command and press **Enter**.

### Example

```
switch:admin> fwmailcfg

1 : Show Mail Configuration Information
2 : Disable Email Alert
3 : Enable Email Alert
4 : Send Test Mail
5 : Set Recipient Mail Address for Email Alert
6 : Quit
Select an item => : (1..6) [6]
```

2. Type 3 and press **Enter** to enable email alerts.

### Example

```
1 : Show Mail Configuration Information
2 : Disable Email Alert
3 : Enable Email Alert
4 : Send Test Mail
5 : Set Recipient Mail Address for Email Alert
6 : Quit
Select an item => : (1..6) [6] 3
```

3. Type a class for which to enable alerts and press **Enter**.

**Example**

```
Mail Enable Menu
-----
1 : Environment class
2 : SFP class
3 : Port class
4 : Fabric class
5 : E-Port class
6 : F/FL Port (Optical) class
7 : Alpha Performance Monitor class
8 : End-to-End Performance Monitor class
9 : Filter Performance Monitor class
10 : Security class
11 : Switch Availability Monitor class
12 : FRU class
13 : Quit
Select an item => : (1..13) [13] 1

Email Alert is enabled!
```

4. Next, define the recipient for an email alert: type **5** and press **Enter**.

**Example**

```
1 : Show Mail Configuration Information
2 : Disable Email Alert
3 : Enable Email Alert
4 : Send Test Mail
5 : Set Recipient Mail Address for Email Alert
6 : Quit
Select an item => : (1..6) [6] 5
```

5. Select a class to set your email configuration and press **Enter**.

**Example**

```

Select an item => : (1..6) [6] 5
Mail Config Menu

  1 : Environment class
  2 : SFP class
  3 : Port class
  4 : Fabric class
  5 : E-Port class
  6 : F/FL Port (Optical) class
  7 : Alpa Performance Monitor class
  8 : End-to-End Performance Monitor class
  9 : Filter Performance Monitor class
 10 : Security class
 11 : Switch Availability Monitor class
 12 : FRU class
 13 : Quit
Select an item => : (1..13) [13] 1
Mail To: []

```

6. Type the recipient's email address and press **Enter**.

**Example**

```

Mail Config Menu

  1 : Environment class
  2 : SFP class
  3 : Port class
  4 : Fabric class
  5 : E-Port class
  6 : F/FL Port (Optical) class
  7 : Alpa Performance Monitor class
  8 : End-to-End Performance Monitor class
  9 : Filter Performance Monitor class
 10 : Security class
 11 : Switch Availability Monitor class
 12 : FRU class
 13 : Quit
Select an item => : (1..13) [13] 1
Mail To: [jng@hp.com] user
user@example.com
Email Alert configuration succeeded!

```

7. Press **Enter** to quit.

# Using Fabric Watch with Advanced Web Tools

## 4

Advanced Web Tools is Fabric Watch is a GUI that you can use to configure Fabric Watch.

This chapter contains the following sections:

- [Navigate to Fabric Watch](#), page 80
- [Configure Alarms](#), page 81
- [Configure Threshold Boundaries](#), page 82
- [Configure Threshold Behaviors](#), page 83
- [Configure Email Alerts](#), page 84

## Navigate to Fabric Watch

To use Fabric Watch with Advanced Web Tools:

1. Open your Web browser and navigate to your switch.
2. To access Fabric Watch View, click the **Watch** button, shown in [Figure 3](#).



**Figure 3:** Watch button



## Configure Alarms

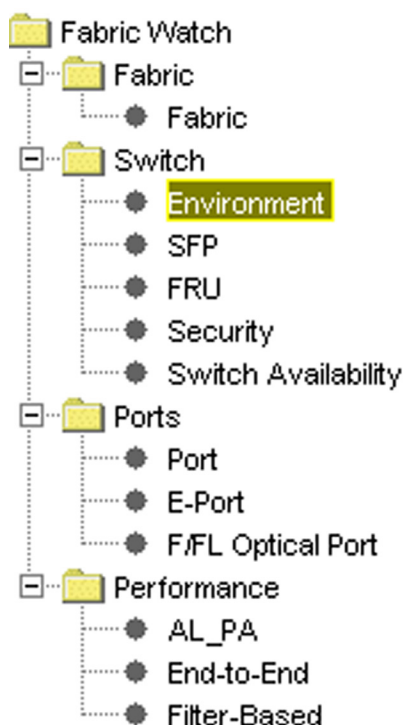
Use these steps to configure Fabric Watch alarms using Advanced Web Tools.

1. Click the **Threshold Configuration** tab at the top of the Fabric Watch **Application** window.
2. From the left column of the display, click the class whose thresholds are being configured.
3. From the **Select Area** menu, select the area to configure.
4. Click the **Area Configuration** tab.
5. In the left column of the **Alarm Notification Mechanisms** dialog box, check the events whose occurrence should trigger an alarm.
6. For each event, check the type or types of alarm that the event will trigger.
7. From the **Select Alarm Level** menu, select **Custom** and click **Apply**.

## Configure Threshold Boundaries

To configure Fabric Watch threshold boundaries using Advanced Web Tools:

1. At the top of the Fabric Watch **Application** window, click the **Threshold Configuration** tab.
2. From the Fabric Watch navigation tree, click the class whose thresholds are being configured. The Fabric Watch navigation tree displays, shown in [Figure 4](#).



**Figure 4: Fabric Watch navigation tree**

3. From the **Select Area** menu, type the area to configure.
4. Click the **Area Configuration** tab to view area-based variables.
5. Enter boundary values in the appropriate dialog boxes.
6. From the **Select Boundary Level** menu, select **Custom** and click **Apply**.

## Configure Threshold Behaviors

Use these steps to configure Fabric Watch threshold behavior using Advanced Web Tools:

1. At the top of the Fabric Watch **Application** window, click the **Threshold Configuration** tab of the Fabric Watch **Application** window.
2. From the left column of the display, click the class whose thresholds to configure.
3. From the **Select Area** menu, select the area to configure.
4. Click the **Element Configuration** tab.
5. From the **Select Element** menu, select the element whose threshold to configure.
6. In the **Behavior Type** dialog box, click either the **Triggered** or **Continuous** button to configure the threshold behavior. If you chose triggered behavior, continue to the next section; if you chose continuous behavior, complete step 7.
7. From the **Time Interval** menu, select the frequency, in seconds, with which Fabric Watch will report ongoing events.

## Configure Email Alerts

For more information about configuring Fabric Watch to use email alerts using the Advanced Web Tools, refer to the *HP StorageWorks Advanced Web Tools 4.2.x User Guide*. Specifically, refer to Chapter 4, “Switch Admin” for a description of the DNS server to configure before you can use the email notification in Fabric Watch. Next, read Chapter 6, “Fabric Watch”, to learn how to use the email **Configuration** tab to enable and configure Email alarm notifications.

A different email configuration can be set for each class. For example, one email notification can be set for SFPs and another can be set for E\_Ports.

# Using Fabric Watch with SNMP

## 5

There are many SNMP browsers, all of which have different uses. Your browser may differ from the one used in the example in “[Using a MIB Browser](#)” on page 87.

This chapter contains the following sections:

- [General Instructions](#), page 86
- [Using a MIB Browser](#), page 87

## General Instructions

To configure Fabric Watch with SNMP, you must use an SNMP browser. The instructions that follow provide only the high-level, basic steps needed to configure Fabric Watch with SNMP:

1. Load the MIB file from the SNMP browser.
2. Type `agtcfgset` to configure the agent on the switch.

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**Note:** All Fabric OS v4.2.x commands are described in the *HP StorageWorks Fabric OS 4.2.x Command Reference Guide*.

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3. Configure the switch to give permission to the server. The server requires only Read access to send a trap. The server requires Write access to set a threshold.
4. In your SNMP browser, enter the switch IP address and community.
5. Type `SNMP set` to configure thresholds.

## Using a MIB Browser

As an example, the steps that follow describe how to configure Fabric Watch with a MIB browser. Procedures may differ, depending on your MIB browser.

1. Open the MIB browser.
2. Load your MIB file. The MIB file provides the Fabric Watch objects that you will configure. The MIB browser cannot communicate with the switch until you load the MIB file.

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**Note:** For more information on using MIBs, refer to the *HP StorageWorks MIB 4.2.x Reference Guide*.

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In your MIB browser, navigate to the `swFwSystem` directory.

3. Log into your switch.
4. Type `agtcfgset` to configure the switch to communicate with your SNMP server. Configure fields as appropriate for your SNMP requirements.

### Example

```
sqa2174:admin> agtcfgset

Customizing MIB-II system variables ...

At each prompt, do one of the followings:
  o <Return> to accept current value,
  o enter the appropriate new value,
  o <Control-D> to skip the rest of configuration, or
  o <Control-C> to cancel any change.

To correct any input mistake:
<Backspace> erases the previous character,
<Control-U> erases the whole line,
sysDescr: [Fibre Channel Switch.]
sysLocation: [End User Premise]
sysContact: [Field Support.]
swEventTrapLevel: (0..5) [0]
authTrapsEnabled (true, t, false, f): [false]

SNMP community and trap recipient configuration:
Community (Secret C0de)
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community (OrigEquipMfr)
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community (private)
Trap Recipient's IP address in dot notation: [0.0.0.0] 10.32.211.204
Community (public)
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community (common)
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community (FibreChannel)
Trap Recipient's IP address in dot notation: [0.0.0.0]
Committing configuration...done.
```

5. Enter the following parameters per the SNMP browser fields:

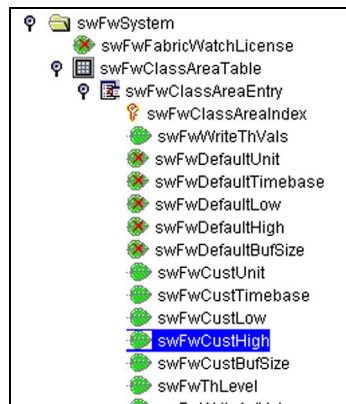
- Switch IP address
- Community name
- Write community name (optional, but required to perform a `set` command)



**Example**

Host	10.32.211.177	Community	*****
Set Value		Write Community	*****
ContextName		ContextEngineID	
Object ID	.iso.org.dod.internet.private.enterprises.bcsi.commDev.fibrechannel.fcSwitch.sw.swFwSystem.swFwClassAreaTable		

6. Select a trait, alarm, behavior, or threshold to configure.

**Example**

7. Type a dot (.) and an index number at the end of the Object ID of the trait to configure.

**Example**

Object ID	.swFwClassAreaTable.swFwClassAreaEntry.swFwCustHigh.1
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8. Type a value in the **Set Value** field to assign to the object.

**Example**

Set Value	100
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9. Click the **Set** button:

**Figure 5: Set button**



# Using Fabric Watch with Configuration Files



When you activate Fabric Watch, the software starts using the default settings described in “[Default Threshold Values](#)” on page 95. You cannot alter these default settings; if the default values do not suit your specific needs, configure Fabric Watch to use more appropriate settings.

When you configure the new settings for Fabric Watch, your switch stores the settings in the configuration file. If you change or add settings directly into the configuration file, those settings become your custom configuration.

This chapter summarizes the two methods for updating:

- [Configuration Files](#), page 92
- [Profiles](#), page 93

## Configuration Files

You can manually edit the configurations files to ensure that the settings are correct for your system.

To custom configure Fabric Watch with the configuration file:

1. Type `configupload` to upload your configuration file to your host.
2. Use a text editor to edit the Fabric Watch values for the elements to change.
3. Type `configdownload` to download the updated configuration to your switch.
4. Type `fwconfigreload` to reload the Fabric Watch configuration.

## Profiles

HP provides partial configuration files, or *profiles*, that help you configure Fabric Watch in a way that is most appropriate to your particular SAN needs.

To configure Fabric Watch with a profile:

1. Upload the configuration file to the host by typing `configupload`.
2. To access Fabric Watch profiles:
  - a. Go to <http://www.hp.com>.
  - b. Click **Storage**.
  - c. Click **SAN Infrastructure**.
  - d. Click **Core Switch 2/64 power pack**.
  - e. Click **software, firmware & drivers**.
  - f. Click **Cross operating system (BIOS, Firmware, etc.)**
  - g. Scroll down to **Profiles**.
3. Open your configuration file in a text editor.
4. Copy the contents of the profile and append that information to the **[Configuration]** section of the configuration file.
5. The contents of the profile overwrite any duplicate configurations that appear earlier in the configuration.
6. To download your updated configuration to your switch, enter the `configdownload` command.

[Table 20](#) provides descriptions of prefabricated Fabric Watch profiles.

**Table 20: Fabric Watch Profile Descriptions**

Profile	Description
fw.enterprise.backbone.errlog	Monitors HP StorageWorks switches in an enterprise backbone SAN environment. Compared to the workgroup profile, the enterprise backbone profile has more stringent environment and SFP class boundaries. However, the port-related classes have doubled high threshold boundaries. In a normal operating switch, this enables Fabric Watch to be more tolerant to these counter values due to the higher traffic volume through a backbone switch.
fw.enterprise.backbone.snmp	Differs only from fw.enterprise.backbone.snmp in that all the threshold alarms are generated through SNMP trap rather than ERRLOG.
fw.workgroup.errlog	Monitors HP StorageWorks switches in a workgroup-level SAN environment.
fw.workgroup.snmp	Differs only from fw.workgroup.errlog in that all the threshold alarms are generated through SNMP Trap rather than ERRLOG.

# Default Threshold Values



This Appendix contains a list of default threshold settings used for Fabric Watch. The FRU class uses no default values.

## Switch Threshold Defaults

The following tables list all default Fabric Watch settings for the following switch models:

- SAN Director 2/128
- Core Switch 2/64
- SAN Switch 2/32
- SAN Switch 2/8V
- SAN Switch 2/16V and SAN Switch 2/16N FF

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**Note:** Settings for firmware earlier than Fabric OS v4.2.x. may differ.

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## Environment Class

Figure 21 provides default settings for areas in the Environment class.

**Table 21: Environment-Class Threshold Defaults<sup>1</sup>**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Fan <sup>a</sup>	Monitors switch fan speed in RPMs	Unit: RPM Time Base: Low: 2000 High: 3400 Buffer: 3	Changed: 0 Exceeded: 0 Above: 3 Below: 3 In-between: 0	Informative Informative Faulty Faulty Informative
Power Supply	Monitors power supply condition	Unit: 1OK/0FAULTY Time Base: Low: 1 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 3 Above: 3 In-between: 0	Informative Informative Faulty Normal Informative
Temperature <sup>a</sup>	Monitors switch temperature in Celsius	Unit: C Time Base: Low: 0 High: 75 Buffer: 10	Changed: 0 Exceeded: 0 Below: 3 Above: 3 In-between: 3	Informative Faulty Faulty Faulty Normal

1. These defaults are hardware-dependent. Check the appropriate Hardware Reference Manual for differences in environmental requirements.



## Fabric Class

Table 22 provides default settings for areas in the Fabric class.

**Table 22: Fabric-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Domain ID Changes	Monitors forcible DOMAIN ID changes	Unit: DID Change(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
GBIC Change	Monitors the insertion and removal of GBIC	Unit: Change(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
Loss of E_Port	Monitors E_Port status	Unit: Down(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
Fabric Logins	Monitors fabric logins	Unit: Login(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
Fabric Q<->L	Monitors QuickLoop changes	Unit: Change(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
Fabric Reconfiguration	Monitors configuration changes	Unit: Reconfig(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative

**Table 22: Fabric-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Segmentation Changes	Monitors segmentation changes	Unit: Segmentation(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
SFP State Changes	Monitors SFP state changes	Unit: Change(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
Zone Changes	Monitors zone changes	Unit: Zone Change(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative

## Performance Monitor Class

[Table 23](#) provides default settings for areas in the AL\_PA Performance Monitor class.

**Table 23: AL\_PA Performance Monitor-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Alpa invalid CRCS	Monitors the number of CRC errors	Unit: Error(s) Time Base: minute Low: 0 High: 60 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Normal Faulty Informative

Table 24 provides default settings for areas in the Customer Defined Performance Monitor class.

**Table 24: Customer Defined Performance Monitor-class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Filter customer-defined		Unit: Frame(s) Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative

Table 25 provides default settings for areas in the End-to-End Performance Monitor class.

**Table 25: End-to-End Performance Monitor-class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
End-to-End invalid CRCs	Monitors the number of CRC errors	Unit: Errors Time Base: minute Low: 1 High: 10 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Normal Faulty Informative
End-to-end receive performance	Monitors receive rate in KB/sec	Unit: KB/sec Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
End-to-end transmit performance	Monitors transmit rate in KB/sec	Unit: KB/sec Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative

## Port Class

Table 26 provides default settings for areas in the Port class.

**Table 26: Port-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Invalid CRC count	Monitors the number of CRC errors	Unit: Error(s) Time Base: minute Low: 1 High: 60 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
Invalid transmission word	Monitors the number of invalid words transmitted	Unit: Error(s) Time Base: minute Low: 1 High: 60 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
Link failure count	Monitors the number of link failures	Unit: Error(s) Time Base: minute Low: 1 High: 60 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
Loss of signal count	Monitors the number of signal loss errors	Unit: Error(s) Time Base: minute Low: 1 High: 120 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
Loss of synchronization count	Monitors the number of loss of synchronization errors	Unit: Error(s) Time Base: minute Low: 1 High: 120 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
Primitive sequence protocol error	Monitors number of primitive sequence protocol errors	Unit: Error(s) Time Base: minute Low: 1 High: 60 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative

**Table 26: Port-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Receive Performance	Monitors receive rate in KB/sec	Unit: KB/sec Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
State Changes	Monitors state changes	Unit: Error(s) Time Base: minute Low: 1 High: 120 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
Transmit Performance	Monitors transmission rate in KB/sec	Unit: KB/sec Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative

Table 27 provides default settings for areas in the E\_Port class.

**Table 27: E\_Port-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
E_Port invalid CRC count	Monitors the number of CRC errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
E_Port invalid transmission word	Monitors the number of invalid words transmitted	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 5 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
E_Port link failure count	Monitors the number of link failures	Unit: Down(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative

**Table 27: E\_Port-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
E_Port loss of signal count	Monitors the number of signal loss errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
E_Port loss of synchronization count	Monitors the number of loss of synchronization errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
E_port primitive sequence protocol error	Monitors the number of primitive sequence protocol errors	Unit: Error(s) Time Base: minute Low: 1 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
E_Port receive performance	Monitors the receive rate in MB/sec	Unit: KB/sec Time Base: Low: 120,000 High: 220,000 Buffer: 0	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 0	Informative Informative Informative Informative Informative
E_Port State Changes	Monitors state changes	Unit: Changes Time Base: minute Low: 1 High: 15 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
E-Port transmit performance	Monitors the transmit rate in MB/sec	Unit: KB/sec Time Base: 0 Low: 120,000 High: 220,000 Buffer: 0	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 0	Informative Informative Informative Informative Informative

Table 28 provides default settings for areas in the F/FL\_Port class.

**Table 28: F/FL-Port-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
FL_Port (optical) loss of synchronization count	Monitors the number of loss of synchronization errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
FL_Optical Port receive performance	Monitors the receive rate in MB/sec	Unit: KB/sec Time Base: Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
FL_Optical Port State Changes	Monitors state changes	Unit: Changes Time Base: minute Low: 1 High: 15 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
FL_Optical Port transmit performance	Monitors the transmit rate in KB/sec	Unit: KB/sec Time Base: 0 Low: 0 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
FL_Port (Optical) invalid CRC count	Monitors the number of CRC errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
FL_Port (optical) invalid transmission word	Monitors the number of invalid words transmitted	Unit: Error(s) Time Base: minute Low: 1 High: 0 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative

**Table 28: F/FL-Port-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
FL_Port (optical) link failure count	Monitors the number of link failures	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
FL_Port (optical) loss of signal count	Monitors the number of signal loss errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative
FL_Port (optical) primitive sequence protocol error	Monitors the number of primitive sequence protocol errors	Unit: Error(s) Time Base: minute Low: 1 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-between: 0	Informative Informative Normal Faulty Informative



## Security Class

Table 29 provides default settings for areas in the Security class.

**Table 29: Security-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
API Violations	Monitors API violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
DCC Violations	Monitors DCC violations	Unit: Violation(s) Time Base: Low: 1 High: 4 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Front Panel Violations	Monitors front panel violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
HTTP Violations	Monitors HTTP violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Illegal Command	Monitors illegal commands	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Incompatible Security DB	Monitors incompatible security databases	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational

**Table 29: Security-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Invalid Certificates	Monitors invalid certificates	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Invalid Signatures	Monitors invalid signatures	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Invalid Timestamp	Monitors invalid timestamps	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Login Violations	Monitors login violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
MS Violations	Monitors MS violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
No-FCS	Monitors No-FCS	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational

**Table 29: Security-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
RSNMP Violations	Monitors RSNMP violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
SCC Violations	Monitors SCC violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
Serial Violations	Monitors serial violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
SES Violations	Monitors RSNMP violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
SES Violations	Monitors SES violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
SLAP Bad Packets	Monitors SLAP bad packets	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
SLAP Failures	Monitors SLAP failures	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational

**Table 29: Security-Class Threshold Defaults (Continued)**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Telnet Violations	Monitors telnet violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
TS out of Sync	Monitors instances where the TS is out of sync	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational
WSNMP Violations	Monitors WSNMP violations	Unit: Violation(s) Time Base: Low: 1 High: 2 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 3 In-Between: 0	Informational Informational Normal Faulty Informational

## SFP Class

Table 30 provides default settings for areas in the SFP class.

**Table 30: SFP-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Current	Monitors SFP current in mAmps	Unit: mA Time Base: Low: 0 High: 50 Buffer: 1	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 0	Informative Informative Faulty Normal Informative
Receive Power	Monitors receive power in $\mu$ Watts	Unit: $\mu$ Watts Time Base: Low: 0 High: 5000 Buffer: 25	Changed: 0 Exceeded: 0 Below: 0 Above: 0 In-between: 0	Informative Informative Informative Informative Informative
Supply Voltage	Monitors SFP current in volt(s)	Unit: 1OK/0FAULTY Time Base: Low: 3150 High: 3600 Buffer: 10	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 0	Informative Informative Faulty Normal Informative
Temperature	Monitors SFP(s) Temperature in Celsius	Unit: C Time Base: Low: -10 High: 85 Buffer: 3	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 1	Informative Faulty Faulty Faulty Normal
Transmit Power	Monitors transmit power in $\mu$ Watts	Unit: $\mu$ Watts Time Base: Low: 0 High: 5000 Buffer: 25	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-between: 0	Informative Informative Informative Informative Informative

## Switch Availability Monitor (SAM) Class

Table 31 provides default settings for areas in the Switch Availability Monitor class.

**Table 31: Switch Availability Monitor-Class Threshold Defaults**

Area	Description	Default Threshold Settings	Default Alarm Settings	Threshold State
Down Time	Monitors port down time	Unit: Percentage(s) Time Base: Low: 0 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-Between: 1	Informational Informational Normal Informational Informational
Duration of Occurrence	Monitors duration of occurrences of faulty ports	Unit: Percentage(s) Time Base: Low: 0 High: 5 Buffer: 0	Changed: 0 Exceeded: 0 Below: 0 Above: 1 In-Between: 0	Informational Informational Normal Informational Informational
Frequency of Occurrence	Monitors frequency of occurrences of faulty ports	Unit: Percentage(s) Time Base: Low: 0 High: 1 Buffer: 0	Changed: 0 Exceeded: 0 Below: 1 Above: 1 In-Between: 0	Informational Informational Normal Informational Informational
Up Time	Monitors port up time	Unit: Percentage(s) Time Base: Low: 95 High: 100 Buffer: 1	Changed: 0 Exceeded: 0 Below: 1 Above: 0 In-Between: 0	Informational Informational Informational Normal Informational

## A

**AL\_PA**

Arbitrated loop physical address. A unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

**alias server**

A fabric software facility that supports multicast group management.

**API**

Application programming interface. A defined protocol that allows applications to interface with a set of services.

**AW\_TOV**

Arbitration wait time-out value. The minimum time an arbitrating L\_Port waits for a response before beginning loop initialization.

## B

**backup FCS switch**

Backup fabric configuration server switch. The switch or switches assigned as backup in case the primary FCS switch fails. *See also* <Link>FCS switch, <Link>primary FCS switch.

**bandwidth**

The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a link or system. *See also* <Link>throughput.

**broadcast**

The transmission of data from a single source to all devices in the fabric, regardless of zoning.

**buffer-to-buffer flow control**

Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop.

**C****CLI**

Command line interface. Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

**compact flash**

Flash (temporary) memory that is used in a manner similar to hard disk storage. It is connected to a bridging component which connects to the PCI bus of the processor. Not visible within the processor's memory space.

**Configuration**

The way in which a system is set up. May refer to hardware or software.

**Hardware:** The number, type, and arrangement of components that make up a system or network.

**Software:** The set of parameters that guide switch operation. May include general system parameters, IP address information, domain ID, and other information. Modifiable by any login with administrative privileges.

May also refer to a set of zones.

**CRC**

Cyclic redundancy check. A check for transmission errors that is included in every data frame.

**D****data word**

A type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words. *See also* <Link>transmission word.

**defined zone configuration**

The set of all zone objects defined in the fabric. May include multiple zone configurations.

**DLS**

Dynamic load sharing. Dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx\_Port or E\_Port changes status.



**domain ID**

Unique identifier for all switches in a fabric, used in routing frames. Usually automatically assigned by the principal switch, but can be assigned manually. The domain ID for a switch can be any integer between 1 and 239. Generally, the default domain ID is 1.

**E****E\_D\_TOV**

Error detect time-out value. The minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.

**E\_Port**

Expansion port. A type of switch port that can be connected to an E\_Port on another switch to create an ISL.

**EE\_Credit**

End-to-end credit. The number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination.

**EIA rack**

A storage rack that meets the standards set by the Electronics Industry Association.

**enabled zone configuration**

The currently enabled configuration of zones. Only one configuration can be enabled at a time.

**end-to-end flow control**

Governs flow of class 1 and 2 frames between N\_Ports.

**error**

As applies to fibre channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

**exchange**

The highest level fibre channel mechanism used for communication between N\_Ports. Composed of one or more related sequences, and can work in either one or both directions.

## F

**F\_Port**

Fabric port. A port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N\_Port to a switch.

**fabric**

A fibre channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric.

**fabric name**

The unique identifier assigned to a fabric and communicated during login and port discovery.

**FCIA**

Fibre Channel Industry Association. An international organization of fibre channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards.

**FCP**

Fibre channel protocol. Mapping of protocols onto the fibre channel standard protocols. For example, SCSI FCP maps SCSI-3 onto fibre channel.

**FCS switch**

Fabric Configuration Server Switch. One or more designated switches that store and manage the configuration and security parameters for all switches in the fabric. FCS switches are designated by WWN, and the list of designated switches is communicated fabric-wide.

**fill word**

An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the fibre channel link active.

**FL\_Port**

Fabric loop port. A port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL\_Port to a switch.

**FRU**

Field-Replaceable Unit. A component that can be replaced on site.

**FS**

Fibre Channel Service. A service that is defined by fibre channel standards and exists at a well-known address. For example, the Simple Name Server is a fibre channel service.

**FSP**

Fibre channel service protocol. The common protocol for all fabric services, transparent to the fabric type or topology.

**FSPF**

Fabric shortest path first. HP's routing protocol for fibre channel switches.

**Fx\_Port**

A fabric port that can operate as either an F\_Port or FL\_Port.

**G****G\_Port**

Generic port. A port that can operate as either an E\_Port or F\_Port. A port is defined as a G\_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

**H****hard address**

The AL\_PA that an NL\_Port attempts to acquire during loop initialization.

**I****idle**

Continuous transmission of an ordered set over a fibre channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

**integrated fabric**

The fabric created by connecting multiple switches with multiple ISL cables, and configuring the switches to handle traffic as a seamless group.

**ISL trunking**

The distribution of traffic over the combined bandwidth of multiple ISLs. A set of trunked ISLs is called a "trunking group", and the ports in a trunking group are called "trunking ports".

**isolated E\_Port**

An E\_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E\_D\_TOVs).

## K

### **K28.5**

A special 10-bit character used to indicate the beginning of a transmission word that performs fibre channel control and signaling functions. The first seven bits of the character are the comma pattern.

### **kernel flash**

Flash (temporary) memory connected to the peripheral bus of the processor, and visible within the processor's memory space. Also known as “user flash”.

## L

### **L\_Port**

Loop port. A node port (NL\_Port) or fabric port (FL\_Port) that has arbitrated loop capabilities. An L\_Port can be in one of two modes:

**Fabric mode:** Connected to a port that is not loop capable, and using fabric protocol.

**Loop mode:** In an arbitrated loop and using loop protocol. An L\_Port in loop mode can also be in participating mode or non-participating mode.

### **latency**

The period of time required to transmit a frame, from the time it is sent until it arrives. Together, latency and bandwidth define the speed and capacity of a link or system.

### **link**

As applies to fibre channel, a physical connection between two ports, consisting of both transmit and receive fibres.

### **link services**

A protocol for link-related actions.

### **LIP**

Loop initialization primitive. The signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

### **LM\_TOV**

Loop master time-out value. The minimum time that the loop master waits for a loop initialization sequence to return.

**loop failure**

Loss of signal within a loop for any period of time, or loss of synchronization for longer than the time-out value.

**loop initialization**

The logical procedure used by an L\_Port to discover its environment. Can be used to assign AL\_PA addresses, detect loop failure, or reset a node.

**Loop\_ID**

A hex value representing one of the 127 possible AL\_PA values in an arbitrated loop.

**LPSM**

Loop Port State Machine. The logical entity that performs arbitrated loop protocols and defines the behavior of L\_Ports when they require access to an arbitrated loop.

**LWL**

Long wavelength. A type of fiber optic cabling that is based on 1300nm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

## M

**master port**

The port that determines the routing paths for all traffic flowing through a trunking group. One of the ports that is in the first ISL in the trunking group is designated as the master port for that group.

**MIB**

Management Information Base. An SNMP structure to help with device management, providing configuration and device information.

**multicast**

The transmission of data from a single source to multiple specified N\_Ports (as opposed to all the ports on the network).

## P

**N\_Port**

Node port. A port on a node that can connect to a fibre channel port or to another N\_Port in a point-to-point connection.

**name server**

Frequently used to indicate Simple Name Server.

**NL\_Port**

Node loop port. A node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL\_Port.

**node**

A fibre channel device that contains an N\_Port or NL\_Port.

**non-participating mode**

A mode in which an L\_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL\_PA cannot be acquired.

**Nx\_Port**

A node port that can operate as either an N\_Port or NL\_Port.

## P

**packet**

A set of information transmitted across a network.

**participating mode**

A mode in which an L\_Port in a loop has a valid AL\_PA and can arbitrate, send frames, and retransmit received transmissions.

**path selection**

The selection of a transmission path through the fabric. HP switches use the FSPF protocol.

**phantom address**

An AL\_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL\_PA.

**phantom device**

A device that is not physically in an arbitrated loop but is logically included through the use of a phantom address.

**PLOGI**

Port login. The port-to-port login process by which initiators establish sessions with targets.

**point-to-point**

A fibre channel topology that employs direct links between each pair of communicating entities.

**port cage**

The metal casing extending out of the fibre channel port on the switch, and into which a GBIC or SFP transceiver can be inserted.

**Port\_Name**

The unique identifier assigned to a fibre channel port. Communicated during login and port discovery.

**POST**

Power On Self-Test. A series of tests run by a switch after it is powered on.

**primary FCS switch**

Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric.

**private loop**

An arbitrated loop that does not include a participating FL\_Port.

**private NL\_Port**

An NL\_Port that communicates only with other private NL\_Ports in the same loop and does not log into the fabric.

**public device**

A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.

**public loop**

An arbitrated loop that includes a participating FL\_Port, and may contain both public and private NL\_Ports.

**public NL\_Port**

An NL\_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL\_Ports.

## Q

**quad**

A group of four adjacent ports that share a common pool of frame buffers.

## R

**R\_A\_TOV**

Resource allocation time-out value. The maximum time a frame can be delayed in the fabric and still be delivered.

**RAID**

Redundant Array Of Independent Disks. A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking.

**request rate**

The rate at which requests arrive at a servicing entity.

**route**

As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.

**routing**

The assignment of frames to specific switch ports, according to frame destination.

**RR\_TOV**

Resource recovery time-out value. The minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

**RSCN**

Registered state change notification. A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

## S

**SAN**

Storage Area Network. A network of systems and storage devices that communicate using fibre channel protocols.

**SDRAM**

The main memory for the switch.

**sequence**

A group of related frames transmitted in the same direction between two N\_Ports.

**service rate**

The rate at which an entity can service requests.

**single mode**

The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.



**SNMP**

Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

**SNS**

Simple Name Server. A switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. SNS is defined by fibre channel standards and exists at a well-known address. May also be referred to as directory service. *See also* <Link>FS.

**switch**

Hardware that routes frames according to fibre channel protocol and is controlled by software.

**switch port**

A port on a switch. Switch ports can be E\_Ports, F\_Ports, or FL\_Ports.

**SWL**

Short wavelength. A type of fiber optic cabling that is based on 850nm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

## T

**tenancy**

The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

**throughput**

The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).

**topology**

As applies to fibre channel, the configuration of the fibre channel network and the resulting communication paths allowed. There are three possible topologies:

**Point to point:** A direct link between two communication ports.

**Switched fabric:** Multiple N\_Ports linked to a switch by F\_Ports.

**Arbitrated loop:** Multiple NL\_Ports connected in a loop.

**transmission character**

A 10-bit character encoded according to the rules of the 8b/10b algorithm.

**transmission word**

A group of four transmission characters.

**trap (SNMP)** The message sent by an SNMP agent to inform the SNMP management station of a critical error.

## U

**U\_Port**

Universal port. A switch port that can operate as a G\_Port, E\_Port, F\_Port, or FL\_Port. A port is defined as a U\_Port when it is not connected or has not yet assumed a specific function in the fabric.

## W

**well-known address**

As pertaining to fibre channel, a logical address defined by the fibre channel standards as assigned to a specific function, and stored on the switch.

**workstation**

A computer used to access and manage the fabric. May also be referred to as a management station or host.

**WWN**

World Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

## Z

**zone**

A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.

**zone configuration**

A specified set of zones. Enabling a configuration enables all zones in that configuration.

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